



TENNESSEE DEPARTMENT OF

EDUCATION
FIRST TO THE TOP

Plant and Soil Science

Primary Career Cluster:	Agriculture, Food and Natural Resources
Consultant:	Steven Gass, (615) 532-2847, Steven.Gass@tn.gov
Course Code(s):	5950
Prerequisite(s):	<i>Applied Environmental Science</i> (6114)
Credit:	1
Grade Level:	11
Graduation Requirements:	This course satisfies one of three credits required for an elective focus when taken in conjunction with other Agriculture courses.
Programs of Study and Sequence:	This is the third course in the <i>Environmental and Natural Resources</i> program of study.
Aligned Student Organization(s):	FFA: http://www.tnffa.org Allie Ellis, (615) 253-5207, Allie.Ellis@tn.gov
Coordinating Work-Based Learning:	All Agriculture students are encouraged to participate in a Supervised Agricultural Experience (SAE) program. In addition, Teachers are encouraged to use embedded WBL activities. For information, visit http://tn.gov/education/cte/work_based_learning.shtml .
Available Student Industry Certifications:	None
Dual Credit or Dual Enrollment Opportunities:	There are currently dual enrollment opportunities available with specific universities, including University of Tennessee at Martin.
Teacher Endorsement(s):	048, 150, 448
Required Teacher Certifications/Training:	None
Teacher Resources:	http://www.tn.gov/education/cte/AgricultureFoodNaturalResources.shtml

Course Description

Plant and Soil Science is an applied-knowledge course focusing on the science and management of plants and soils, with special attention given to current agricultural practices that support the healthy and sustainable cultivation of major crops. Upon completion of this course, proficient students will have been exposed to a range of careers associated with the science and management of plants and soils and will have developed the essential skills and knowledge to be successful in science- or agriculture-related occupations. Standards in this course are aligned with Tennessee State Standards for English Language Arts & Literacy in Technical Subjects, Tennessee State Standards in Mathematics, Tennessee state standards in Biology I, Biology II, Ecology, and Environmental Science, as well as National Agriculture, Food and Natural Resources Career Cluster Content Standards.*

Program of Study Application

This is the third course in the *Environmental and Natural Resources* program of study. For more information on the benefits and requirements of implementing this program in full, please visit the Agriculture, Food, & Natural resources website at <http://www.tn.gov/education/cte/AgricultureFoodNaturalResources.shtml>.

Course Standards

History and Importance

- 1) Determine the role of plants and soil in maintaining environmental quality. Trace the history of soil conservation in the United States by developing an informational essay or graphic, citing specific historical events that promoted the development of soil conservation methodologies found in academic journals and news media. (TN Reading 1, 2; TN Writing 4, 7, 9)
- 2) Describe current land management practices for rural, suburban, and urban settings to protect and ensure the quality and quantity of freshwater supply. Conduct a review of a specific municipality to identify existing practices governed by local laws and agency policy. Create a narrative to describe the use of a specific practice, citing specific textual evidence from research. (TN Reading 2; TN Writing 2, 4, 7, 9; TN Biology I 2; TN Biology II 2; TN Environmental Science 4)
- 3) Use local news media, organizational websites, and real-time labor market information to investigate occupations in plant and soil sciences. Compare and contrast the knowledge, skills, and abilities necessary for employment, as well as the typical level of education required. (TN Reading 2, 9; TN Writing 4, 7, 9)
- 4) Review common laboratory safety procedures for tool and equipment operation in plant and soil science laboratories, including but not limited to accident prevention and control procedures. Demonstrate the ability to follow safety and operational procedures in a lab setting and complete a safety test with 100 percent accuracy. (TN Reading 3)

Soil Science

- 5) Create a model or illustration that depicts the formation of soil. Differentiate between the biological, geological, chemical, and physical factors and processes involved in soil formation. (TN Reading 2, 7; TN Writing 4, 9; TN Environmental Science 1)
- 6) Communicate understanding of methods for classifying soils by preparing a guide that accurately describes the procedures for each method using domain specific language. Demonstrate the ability to follow methods for sampling and analyzing the following: soil pH, texture, permeability, water holding capacity, slope, chemical analyses, and soil organisms. (TN Reading 1, 2, 3, 4; TN Writing 4, 7, 9; TN Environmental Science 1)
- 7) Conduct soil profiles, soil analysis, and water availability analysis. Synthesize findings in an argumentative essay. Develop a claim justifying appropriate agricultural, recreational, conservational, and/or aesthetic uses of specific land areas using valid reasoning and citing specific evidence gathered in analyses. (TN Reading 3; TN Writing 1, 4, 7, 9)

Plant Science and Nutrition

- 8) Compare and contrast the anatomy and physiology of monocot and dicot plants used for crop production. (TN Reading 2, 5)
- 9) Create a model depicting the parts and functions of plant cells. Label the structures and describe the functions of plant cell organelles. (TN Reading 2, 4, 7; TN Writing 4; TN Biology I 1; TN Biology II 1, 7)
- 10) Assess the importance of the 16 (sixteen) nutrients essential to plant growth and development. Identify nutritional deficiencies and disorders, distinguish among signs of nutrient deficiency in plants, make recommendations for appropriate treatments, and prescribe preventative control measures for major agricultural crops, including corn, soybean, cotton, tobacco, hay, pasture, and forest. (TN Reading 2, 5; TN Writing 2, 4, 9; TN Biology II 7)
- 11) Investigate the use of fertilizers as a source of essential plant nutrients. Compare and contrast the use of organic and chemical fertilizers, assessing claims made by producers and consumers of fertilizer products found in promotional materials, news articles, and academic journals. Calculate fertilizer formulations and perform various methods of fertilizer application for crops, such as erosion controlling crops. (TN Reading 1, 3, 6, 8; TN Mathematics N-Q,)

Agricultural Practices and Environmental Issues

- 12) Research, compare and contrast traditional, sustainable, and organic agriculture methods and practices. Describe how each method aligns to a specific goal, including but not limited to the following: soil fertility and texture maintenance, adequate soil moisture maintenance, erosion prevention, pollution prevention, and weed, insect, and disease management. Assess the costs and benefits of specific methods and practices. (TN Reading 2, 4, 5, 9; TN Environmental Science 2, 4, 6)
- 13) Identify major agriculture-related pollutants and isolate practices that contribute to the spread of pollution in both urban and traditional agricultural production environments. Develop a list of best practices, citing technical texts to make recommendations for watering procedures, runoff containment, pest control, and chemical use and disposal in both domestic (home) and agricultural production settings. Prepare informational materials emphasizing the importance of using recommended best practices to reduce pollution. (TN Reading 2, 5; TN Writing 4, 7, 9; TN Environmental Science 4, 6, 7)
- 14) Compare and contrast alternative methods for maintaining home landscapes using sustainable and/or organic products that will reduce pollution and soil erosion and conserve water and energy. Develop an argumentative essay that develops a claim about the need for a specific practice to maintain a healthy home landscape, developing claim(s) and counterclaim(s) with reasoning and evidence. (TN Reading 5, 9; TN Writing 1, 4, 7, 9; TN Environmental Science 2, 4, 6, 7)
- 15) Research the use of compost and mulch in improving and rebuilding soils. Create a presentation or resource guide describing various compost methods, including field crop composting, commercial composting, backyard compost piles, vermicomposting, and bokashi. Create a chart

that compares the inputs, time investment, quality, and quantity of compost prepared by each method. (TN Reading 2, 4, 7; TN Writing 4, 7, 9; TN Ecology 4, 6; TN Environmental Science 4, 6)

- 16) Determine characteristics important in selecting a site for optimal growth of plants and crops in rural, suburban, and urban settings. Describe the factors that influence the economics of crop production in each setting. (TN Reading 2; TN Writing 4, 9; TN Environmental Science 2, 4)

Standards Alignment Notes

*References to other standards include:

- TN Reading: [Tennessee State Standards for English Language Arts & Literacy in History/Social Studies, Science, and Technical Subjects](#); Reading Standards for Literacy in Science and Technical Subjects 6-12; Grades 11-12 Students (page 62).
 - Note: While not directly aligned to one specific standard, students who are engaging in activities outlined above should be able to demonstrate fluency in Standard 10 at the conclusion of the course.
- TN Writing: [Tennessee State Standards for English Language Arts & Literacy in History/Social Studies, Science, and Technical Subjects](#); Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects 6-12; Grades 11-12 Students (pages 64-66).
 - Note: While not directly aligned to one specific standard, students who are engaging in activities outlined above should be able to demonstrate fluency in Standards 3, 5, 6, 8, and 10 at the conclusion of the course.
- TN Math: [Tennessee State Standards for Mathematics](#); Math Standards for High School: Number and Quantity.
 - Note: The standards in this course are not meant to teach mathematical concepts. However, the concepts referenced above may provide teachers with opportunities to collaborate with mathematics educators to design project based activities or collaborate on lesson planning. Students who are engaging in activities listed above should be able to demonstrate quantitative reasoning as applied to specific technical concepts. In addition, students will have the opportunity to practice the habits of mind as described in the eight Standards for Mathematical Practice.
- SAE: [Supervised Agricultural Experience](#): All Agriculture students are encouraged to participate in a Supervised Agricultural Experience program to practice and demonstrate the knowledge and skills learned in their agriculture courses.
- TN Biology I: Tennessee Science: [Biology I](#), standards 1 and 2.
- TN Biology II: Tennessee Science: [Biology II](#), standards 1, 2, and 7.
- TN Ecology: Tennessee Science: [Ecology](#), standards 4 and 6.
- TN Environmental Science: Tennessee Science: [Environmental Science](#), standards 1, 2, 4, 6, and 7.
- AFNR: [National Agriculture, Food and Natural Resources \(AFNR\) Career Cluster Content Standards](#): Students engaged in activities outlined above should be able to demonstrate fluency in Standard PS at the conclusion of the course.
- P21: Partnership for 21st Century Skills [Framework for 21st Century Learning](#)
 - Note: While not all standards are specifically aligned, teachers will find the framework helpful for setting expectations for student behavior in their classroom and practicing specific career readiness skills.